

# AN INNOVATIVE METHOD USING A MOBILE APPLICATION IN DETERMINING THE OCCLUSAL PLANE AND NASOLABIAL INCLINATION FOR COMPLETE DENTURE CONSTRUCTION

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## Abstract

*Proper orientation of occlusal plane is mandatory for an esthetically and functionally satisfying complete denture. Occlusal plane analysis using android mobile application, utilizing vertical (for midline) and horizontal lines as reference, is used to capture the photograph of the patient. Images are obtained at a distance of 1m with patient in upright position so that horizontal green line is made to coincide with the ala-tragus line and red line with outer wings of fox plane. The proposed technique is suitable for assessing the midline and nasolabial inclination also. This technique facilitates task of occlusal plane adjustment and orientation an easier and time saving process.*

**Keywords: Ala-tragus line, edentulous, laser level android application, prosthesis**

## Introduction

Esthetics, phonetics, mastication and comfort are the fundamental requirements determining the long term success of a prosthesis<sup>1</sup>. Biting force exerted is greatest when the occlusal plane is made parallel to the ala-tragus line. It decreases with a 5 degrees inclination both anteriorly and posteriorly. Moreover force exertion during various muscle activity is least when the occlusal plane is made parallel to the ala-tragus line<sup>2</sup>. Many researchers suggested use of superior border of tragus as the reference point whereas a few suggested use of middle or inferior point of tragus for the same<sup>3,4</sup>. It was Zarb and Bolender, through their years of research, advocated that the occlusal plane should be made parallel to the ala-tragus line if a satisfactory denture is to be made.<sup>5</sup> Many clinicians consider the ala-tragus line as a line running from the superior border of tragus of the ear to the inferior border of the ala of the nose.<sup>6,7</sup> During routine clinical

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practice, the occlusal plane is made parallel to ala-tragal line posteriorly and interpupillary line anteriorly by repeatedly checking the parallelism of the occlusal rim with the use of instruments like fox plane<sup>8</sup>. Usually a line is drawn on the face with the help of a thread coated with either plaster of paris or pumice is taken as a guide to adjust the occlusal rims in our routine clinical practice. This possesses the disadvantage of frequent redrawing of line which is easily erased during the procedure. Rough visualization of the ala-tragus line is another method of establishing parallelism of the wax occlusion rim. It is noticed that while attempting to stabilize the occlusal rim, the fox plane and tongue depressor, the operator evaluate the angulation from a frequently awkward position as dictated by the hand held items. Previous methods of evaluating parallelism of the occlusion rim and ala-tragus line is often difficult for the operator, especially while working without assistance. Even when assistance is available, precise reorientation of the fox plane and tongue depressor for comparison of the right and left ala-tragal lines to the tentative occlusal rim is difficult with the conventional technique<sup>9</sup>. These limitations call for the implementation of an innovative method for accurate visualization of the occlusal plane. The purpose of this article is to describe a novel technique of using an android application for precise orientation of occlusal plane parallel to ala- tragal line.

## Materials and Methods

1. Fox plane (Dentsply International, Trubyte)
2. Android mobile phone (Lenovo A7000 Lenovo CHINA)
3. Laser Level Tool 2.0 (John Risch, Sweden)
4. Tripod stand (Photron Steady Pro 520)
5. Mobile holder with tripod attachment (Smiledrive Universal Mobile Holder Tripod Attachment)

Laser Level Tool 2.0 (Figure 1, John Risch, Sweden) android application is employed for orientation of occlusal plane in the patient. This level tool employed a camera combined with an accelerometer. It has a vertical and horizontal line both in red and green colors with provision for estimating the degree of tilt. The vertical and horizontal green lines are stationary and are used as the reference plane. The position of red lines can be altered by touching the screen of mobile at the required site. Its orientation can be altered by tilting the mobile phone.

The patient is made to sit in an upright position in the dental chair, looking straight ahead and ala-tragal line parallel to the floor. The maxillary occlusion rim is gently placed in patient's mouth and checked for labial fullness, visibility and lip support.

The Fox plane (Dentsply International, Trubyte) is positioned intraorally so that it makes contact with occlusal rim uniformly. Inferior border of ala of nose and the middle margin of tragus were marked on the patient for occlusal plane determination.

Using an adjustable tripod the height of mobile (Lenovo A7000 Lenovo CHINA), was adjusted according to the patient. Photographs were taken from a fixed distance of one metre from patients mid sagittal plane with subjects with their back straight. (Figure 2)

Photographs were made in such a manner that the horizontal green line coincided with the line joining the middle margin of tragus to inferior border of ala of nose and the tilt showed zero degree. A zero degree on the mobile app implies parallelism to the floor. The position of red line can be altered by touching the screen at the desired position.

Once the photograph is taken, the horizontal red line is made to coincide with outer wings of the

fox plane. Thus degree of tilt and parallelism can be assessed from the photograph. Using the green line as a guide the occlusal plane can be

adjusted in the conventional manner to attain the desired parallelism (Figure 3).

Another photograph with the vertical green

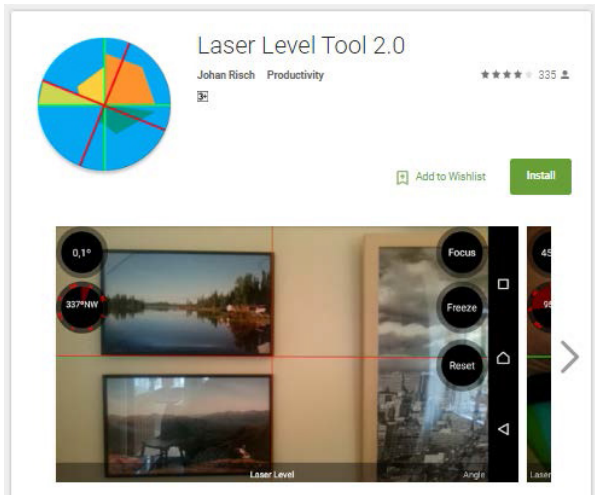


Fig. 1: Laser level 2.0

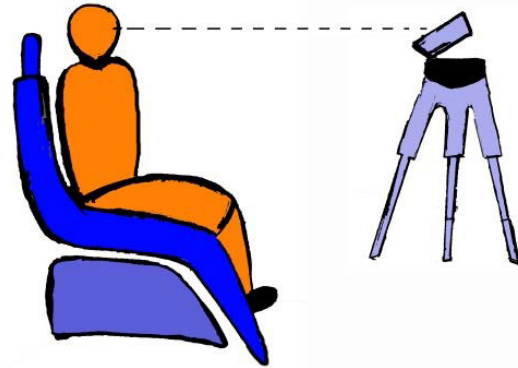


Fig. 2: Schematic Diagram of Proposed Technique



Fig. 3: Assessing the Posterior Occlusal Plane



Fig. 4: Assessing the Anterior Occlusal Plane and Midline

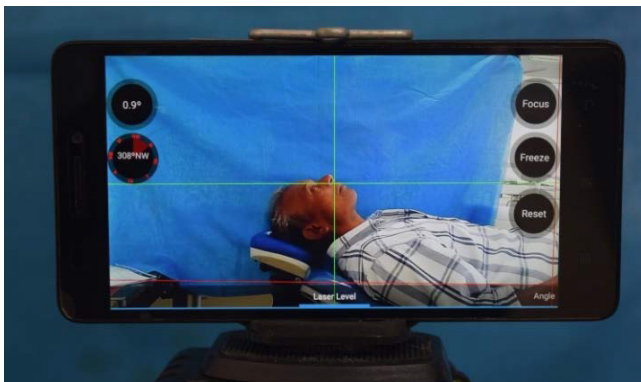


Fig. 5: Method of Finding Nasolabial Inclination



Fig. 6 : Obtaining the Nasolabial Inclination

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line passing through the midline of the patient and horizontal green line coinciding with the interpupillary line was taken to assess the midline and also the parallelism of occlusal plane anteriorly (Figure 4).

The nasolabial inclination can be recorded by making the patient positioned in supine on the dental chair with ala-tragal line perpendicular to floor. Photograph was made with the horizontal green line passing through the philtrum of upper lip and with the point of intersection of the 2 lines coinciding with the junction of philtrum and base of nose (Figure 5). The angle can be recorded by simply placing a line at the desired position (Figure 6).

## Discussion

The conventional techniques described earlier are prone to errors as the line is drawn on the soft tissue of the face and is likely to be smudged, which result in faulty orientation of occlusal plane. Compared to the conventional methods, the technique proposed here is ideal for reorientation and comparison of right and left ala-tragal lines and is a boon while working without assistance. Lenovo A 7000 mobile camera with a resolution of 8 Mega pixels, which is more than adequate for photographic analysis is employed. The in-built zoom lens with an auto focus range to infinity ensured that the image were of high quality. The camera was placed on a standard adjustable tripod stand. The arms and adjustable plates of the tripod stand were set so that mobile was parallel to the horizontal. [10] The perpendicular distance between the subject's sagittal plane and photographic film was 1.0 meter.<sup>11</sup> In the present technique photographs were taken at a zero degree tilt. A 0o indicates that the apparatus is parallel to the floor. Further, the parallelism between the horizontal green and red lines are analysed at 0o and the occlusal rims can be adjusted

accordingly using the photographs obtained. The nasolabial angle can also be derived precisely from this mobile application, which will act as a reference guide in determining fullness of maxillary denture.

The method presented in this article provides a more reliable, reproducible and stable alignment of the occlusal plane to the ala-tragal line than rough visualization. This enables the dentist to simply and quickly establish a well-defined starting point in orientation of occlusal plane in complete denture fabrication. It possesses the following advantages like cost effectiveness, patient friendliness as the apparatus is used outside the mouth. It can be used in patients with facial deformity like in cases of absence of an eye and an ear. It provides a new means of marking the reference plane. It also reduces the need of multiple reinsertion of fox plane in the patient's mouth since the photograph obtained can be used as a guide to adjust the occlusal rim in the laboratory.

## Conclusion

The proposed technique provides a more reliable, stable and reproducible orientation of occlusal plane. It also allows for easy visualization of the facial midline and can also be used to determine the nasolabial angle. Since the procedure is standardized it allows for easy reorientation. Moreover it can be used for adjusting the occlusal plane in patients with facial disfigurements.

**CONFLICT OF INTEREST :** None declared

## References

1. Terrell WH. Fundamentals important to good complete denture construction. *J Prosthet Dent.* 1958;8:740-52.
2. Okane H, Yamashina T, Nagasawa T, Tsuru H. The effect of anteroposterior inclination of the occlusal plane on biting force. *J Prosthet Dent.* 1979;42:497-501.
3. Solomon EGR . The Morphology of Tragus Part 1: The Confusion

- About Tragus Terminology. J Indian Prosthodont Soc. 2000;11:11–5.
- Rostamkhani F, Sahafian A, Kermani H. A cephalometric study on the relationship between the Occlusal Plane, Ala-Tragus and Camper's Lines, in patients with Angle's class III malocclusion. J Dent Tehran Univ Med Sci 2005;2:46–9.
  - Zarb GA, Bolender CL. Prosthodontic Treatment for Edentulous Patients: Complete Dentures and Implant-Supported Protheses. 12th ed, St. Louis: Mosby; 2004, 262 p.
  - Rahn AO, Heartwell CM. Textbook of Complete Denture, 5th ed, Philadelphia: 2002, 160 p.
  - Boucher CO. Current clinical dental terminology, 3rd ed, St. Louis: Mosby; 1982.
  - Fox F. The principles involved in full upper and lower denture construction. Dent Cosm. 1924;66:151.
  - Kuniyal H, Katoch N, Rao PL. "Occlusal plane orientor": An innovative and efficient device for occlusal plane orientation. J Indian Prosthodont Soc. 2012;12:78–80.
  - Kumar S, Garg S, Gupta S. A determination of occlusal plane comparing different levels of the tragus to form ala-tragal line or Camper's line: a photographic study. J Adv Prosthodont 2013 5:9–15.
  - Shaikh SA, Lekha K, Mathur G. Relationship between occlusal plane and three levels of Ala Tragus line in dentulous and partially dentulous patients in different age groups: A pilot study. J Clin Diagn Res 2015;9:39-42.

### Mobile App link

<https://johan-risch-laserlevel.bd.aptoide.com/versions>

<https://play.google.com/store/apps/details?id=com.maruar.laserlevel>